

## REMARKS

### **I. General**

Claims 1-51 were pending in the present application, and all of the pending claims are rejected in the current Office Action (mailed August 17, 2004). The outstanding issues raised in the current Office Action are:

- Claims 1-9, 11-17, 19-25, and 27-44 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,583,790 issued to Wolters (hereinafter “*Wolters*”);
- Claims 10, 26, and 45-48 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Wolters* in view of U.S. Patent No. 6,765,573 issued to Kouadio (hereinafter “*Kouadio*”);
- Claims 49-51 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Wolters*; and
- Claim 18 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Wolters* in view of U.S. Patent No. 5,537,494 issued to Toh (hereinafter “*Toh*”).

In response, Applicant respectfully traverses the outstanding claim rejections, and requests reconsideration and withdrawal thereof in light of the amendments and remarks presented herein.

### **II. Amendments**

Claims 1, 11, and 19 are amended, claim 26 is canceled without prejudice, and new claims 52-54 are added herein. No new matter is added by these amendments and added claims.

Claim 1 is amended to recite that the surface structure is a “homogeneous surface structure” and to recite “wherein said parametric texture map does not include variables representing surface position”. Support for this amendment can be found at page 20 of the present application.

Claim 11 is amended to recite that the surface reflectance data is for a “homogeneous surface” and to recite “creating said parametric texture map, wherein said parametric texture map determines values for pixels of said digital image using an equation that is not a function

of said pixels' surface positions". Support for this amendment can be found at pages 20-22 of the present application.

Claim 19 is amended to include the element originally recited in claim 26. Thus, the amendment to claim 19 effectively rewrites original claim 26 in independent form as claim 19. Therefore, claim 26 is canceled without prejudice. This amendment is not intended to narrow the scope of the original claim 26 in any way, but rather claim 19, as amended, is intended to be afforded the full scope (both literal and under the doctrine of equivalence) as original claim 26.

New claim 52 is added, which depends from claim 1 and recites that the parametric texture map defines the surface structure according to one of the equations listed. Support for this new claim can be found at pages 20-22 of the present application.

New claim 53 is added, which presents original claim 10 in independent form. No new elements beyond those of claim 10, as originally filed, are presented in claim 53. Accordingly, new claim 53 is intended to be afforded the full scope (both literal and under the doctrine of equivalence) as the original dependent claim 10.

New claim 54 is added, which presents original claim 18 in independent form. No new elements beyond those of claim 18, as originally filed, are presented in claim 54. Accordingly, new claim 54 is intended to be afforded the full scope (both literal and under the doctrine of equivalence) as the original dependent claim 18.

### **III. Rejections under 35 U.S.C. § 102(e)**

Claims 1-9, 11-17, 19-25, and 27-44 are rejected under 35 U.S.C. § 102(e) as being anticipated by *Wolters*. Applicant respectfully traverses this rejection as provided further below.

To anticipate a claim under 35 U.S.C. § 102, a single reference must teach every element of the claim, *see* M.P.E.P. § 2131. Applicant respectfully submits that *Wolters* fails to teach each and every element of claims 1-9, 11-17, 19-25, and 27-44.

Independent Claim 1

Independent claim 1, as amended herein, recites “creating a parametric texture map that comprises parameters for an equation that defines a homogeneous surface structure in a manner in which the appearance of the surface structure includes surface reflectance properties, wherein said parametric texture map does not include variables representing surface position” (emphasis added). *Wolters* fails to explicitly teach a parametric texture map that does not include variables representing surface position.

Accordingly, independent claim 1 is not anticipated under 35 U.S.C. § 102 by *Wolters*.

Independent Claim 11

Independent claim 11, as amended herein, recites “creating said parametric texture map, wherein said parametric texture map determines values for pixels of said digital image using an equation that is not a function of said pixels’ surface positions” (emphasis added). *Wolters* fails to explicitly address homogeneous surfaces and fails to explicitly teach a parametric texture map that determines values for pixels of a digital image using an equation that is not a function of the pixels’ surface positions.

Accordingly, independent claim 11 is not anticipated under 35 U.S.C. § 102 by *Wolters*.

Independent Claim 19

As described above, independent claim 19 is amended herein to include the limitation originally presented in dependent claim 26. Thus, claim 26 is effectively rewritten in independent form as claim 19. The present Office Action concedes, in its treatment of claims 10 and 26 on page 6 thereof, that *Wolters* does not explicitly teach a Bidirectional Reflectance Distribution Function (BRDF). However, the present Office Action applies *Wolters* in rejecting claims 10 and 26 under 35 U.S.C. § 103(a). As described further in

Section IV below, under 35 U.S.C. § 103(c), *Wolters* is not a valid prior art reference for use in a § 103(a) rejection. Therefore, claim 19 is believed allowable over the applied references.

#### Independent Claim 27

Independent claim 27 recites “a texture map data structure including a function for representing a texture map of a plurality of texels, said function evaluating at least two independent variables for defining an illumination vector and at least two independent variables for defining a view vector” (emphasis added). *Wolters* fails to explicitly teach a texture map data structure that includes a function that evaluates at least two independent variables for defining an illumination vector and at least two independent variables for defining a view vector. *Wolters* teaches, at column 3, line 60 – column 4, line 5, a parametric texture map data structure that includes the function  $C_i = A1D_u^2 + A2D_v^2 + A3D_uD_v + A4D_u + A5D_v + A6$ , where  $D_u$  and  $D_v$  are the 2D components of a user-defined vector. For instance,  $D_u$  and  $D_v$  may, in certain implementations, be the 2D components of an eye point vector. Col. 4, lines 1-2. As another example,  $D_u$  and  $D_v$  may, in certain implementations, be the 2D components of a half-angle vector. Col. 4, lines 2-5. In other implementations, the  $D_u$  and  $D_v$  variables may be the 2D components of some other user-defined vector. Accordingly, under this function, either two independent variables (i.e.,  $D_u, D_v$ ) for defining an illumination vector or two independent variables (i.e.,  $D_u, D_v$ ) for defining a view vector may be included, but not both two independent variables for defining an illumination vector and two independent variables for defining a view vector, as recited by claim 27.

As described in the present application at page 18, lines 1-20:

A PTM function may comprise four degrees of freedom (or four independent variables). For example, two independent variables ( $L_u$ ,  $L_v$ ) may represent a 2D parameterization of a light position (i.e., represent the light direction), as discussed above, and two independent variables ( $s$ ,  $t$ ) may be included within the PTM function as texture coordinates that allow the properties of a 3D object to vary across its surface. That is, a texture may have different characteristics depending on the surface position....

Accordingly, a traditional PTM function having four degrees of freedom and six coefficients may be represented as follows:

$$PTM(s, t, L_u, L_v) = A(s, t)L_u^2 + B(s, t)L_v^2 + C(s, t)L_uL_v + D(s, t)L_u + E(s, t)L_v + F(s, t).$$

As with the variables  $u$  and  $v$  described above,  $L_u$  and  $L_v$  represent scalar quantities associated with orthogonal components of a vector. For example,  $L_u$  and  $L_v$  may represent the intensity of light from two different directions where the texel is rendered on the three-dimensional object, as described above. And,  $s$  and  $t$  represent texture coordinates that identify a position on the texture.

Thus, a traditional PTM function, such as the exemplary PTM function discussed in *Wolters*, includes two variables ( $D_u$  and  $D_v$ ) that are the 2D components of a user-defined vector. Typically, variables corresponding to surface position of each pixel are included in the PTM function for indexing such PTM function. Thus, the two variables ( $D_u$  and  $D_v$ ) are evaluated by the function based on the corresponding positional variables ( $s$ ,  $t$ ) of a pixel to compute the value of such pixel. Again, *Wolters* does not expressly teach a texture map data structure that includes a function that evaluates at least two independent variables for defining an illumination vector and at least two independent variables for defining a view vector.

Accordingly, independent claim 27 is not anticipated under 35 U.S.C. § 102 by *Wolters*.

### Independent Claim 32

Independent claim 32 recites “a texture map data structure including a function for representing a texture map of a plurality of texels, said function evaluating at least two independent variables for defining a half-angle vector and at least two independent variables for defining a difference vector” (emphasis added). *Wolters* fails to explicitly teach a texture map data structure that includes a function that evaluates at least two independent variables

for defining a half-angle vector and at least two independent variables for defining a difference vector. As described above, *Wolters* teaches, at column 3, line 60 – column 4, line 5, a parametric texture map data structure that includes the function  $C_i = A1D_u^2 + A2D_v^2 + A3D_uD_v + A4D_u + A5D_v + A6$ , where  $D_u$  and  $D_v$  are the 2D components of a user-defined vector. For instance,  $D_u$  and  $D_v$  may, in certain implementations, be the 2D components of an eye point vector. Col. 4, lines 1-2. As another example,  $D_u$  and  $D_v$  may, in certain implementations, be the 2D components of a half-angle vector. Col. 4, lines 2-5. In other implementations, the  $D_u$  and  $D_v$  variables may be the 2D components of some other user-defined vector.

Accordingly, under this function, either two independent variables (i.e.,  $D_u, D_v$ ) for defining a half-angle vector or two independent variables (i.e.,  $D_u, D_v$ ) for defining a difference vector may be included, but not both two independent variables for defining a half-angle vector and two independent variables for defining a difference vector, as recited by claim 32. Typically, a PTM function, such as that of *Wolters* provides only two independent variables corresponding to the 2D components of a user-defined vector (e.g., either a half-angle vector or a difference vector), which are evaluated based on two positional variables (e.g.,  $s, t$ ).

Accordingly, independent claim 32 is not anticipated under 35 U.S.C. § 102 by *Wolters*.

#### Independent Claims 36, 39, and 42

Independent claim 36 recites “using a texture map that includes a function for use in rendering a digital image having surface reflectance properties, wherein said function evaluates more than two variables directed to surface reflectance properties” (emphasis added).

Independent claim 39 recites “a texture map that includes a function for use in rendering a digital image, wherein said function evaluates more than two variables relating to surface reflectance properties of said digital image” (emphasis added).

Independent claim 42 recites “receiving more than two independent variables relating to surface reflectance properties of a digital image to be rendered” (emphasis added).

Thus, each of these claims recite more than two independent variables relating to surface reflectance properties. As discussed above, *Wolters* does not expressly teach a PTM function that includes more than two independent variables relating to surface reflectance properties. Rather, the PTM function of *Wolters* may include two independent variables relating to surface reflectance properties (e.g.,  $D_u$  and  $D_v$ , which may be the 2D components of an eye point vector, or a half-angle vector, or some other user-defined vector). Those  $D_u$  and  $D_v$  variables are typically indexed in a PTM function based on positional variables ( $s, t$ ). The PTM function of *Wolters* does not expressly provide for more than two independent variables that relate to surface reflectance properties.

Accordingly, independent claims 36, 39, and 42 are not anticipated under 35 U.S.C. § 102 by *Wolters*.

#### Dependent Claims

Each of dependent claims 2-9, 12-17, 20-25, 28-31, 33-35, 37-38, 40-41, and 43-44 depend either directly or indirectly from one of independent claims 1, 11, 19, 27, 32, 36, 39, and 42, and thus inherit all limitations of the respective independent claim from which they depend. It is respectfully submitted that dependent claims 2-9, 12-17, 20-25, 28-31, 33-35, 37-38, 40-41, and 43-44 are allowable not only because of their dependency from their respective independent claims for the reasons discussed above, but also in view of their novel claim features (which both narrow the scope of the particular claims and compel a broader interpretation of the respective base claim from which they depend).

#### **IV. Rejections under 35 U.S.C. § 103(a)**

Claims 10, 26, and 45-48 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Wolters* in view of *Kouadio*. Claims 49-51 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Wolters*. And, claim 18 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Wolters* in view of *Toh*.

Each of the above § 103(a) rejections relies on *Wolters*. Applicant respectfully asserts that *Wolters* is not a valid prior art reference for use in a § 103(a) rejection. As amended by the American Inventor's Protection Act of 1999 (the Act), signed on November 29, 1999, section 103(c) now states:

(c) Subject matter developed by another person, which qualifies as prior art only under one or more of sub-sections (e), (f), and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Section 4807 of the Act further provides that this new provision applies to any application filed on or after the date of enactment, November 29, 1999. The present application was filed August 3, 2001.

The Examiner will note that *Wolters* and this application are assigned to the same entity, Hewlett Packard Development Company LP. *Wolters* was filed before, but did not issue until after the current application's filing date. Therefore, the disclosure of *Wolters* is available only as 35 U.S.C. § 102(e)-type prior art. In that regard, 35 U.S.C. § 103(c) now provides that *Wolters* "shall not preclude patentability" of the claimed invention.

Accordingly, the rejections of claims 10, 18, 26, and 45-51 should be withdrawn.

#### **V. New Claims 52-54**

New claim 52 is believed to be allowable over the applied references at least because of its dependency from independent claim 1.

New claim 53 rewrites original claim 10 in independent form. Original claim 10 was rejected in the present Office Action under 35 U.S.C. § 103(a) as being unpatentable over *Wolters* in view of *Kouadio*. However, as discussed above, *Wolters* is not a valid prior art reference for use in a § 103(a) rejection. Thus, claim 53 is believed allowable.

New claim 54 rewrites original claim 18 in independent form. Original claim 18 was rejected in the present Office Action under 35 U.S.C. § 103(a) as being unpatentable over *Wolters* in view of *Toh*. However, as discussed above, *Wolters* is not a valid prior art reference for use in a § 103(a) rejection. Thus, claim 54 is believed allowable.



## VI. Conclusion

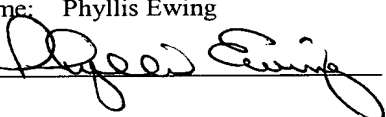
In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

The required fee for this response is enclosed. If any additional fee is due, please charge Deposit Account No. 08-2025, under Order No. 10015864-1 from which the undersigned is authorized to draw.

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail, Label No. EV 482740293US in an envelope addressed to: MS Amendment, Commissioner for Patents, Alexandria, VA 22313.

Date of Deposit: November 17, 2004

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